

ModelCenter-Integrated Reduced Order Multi-fidelity Optimization Scheme for NASA MDAO Framework, Phase I

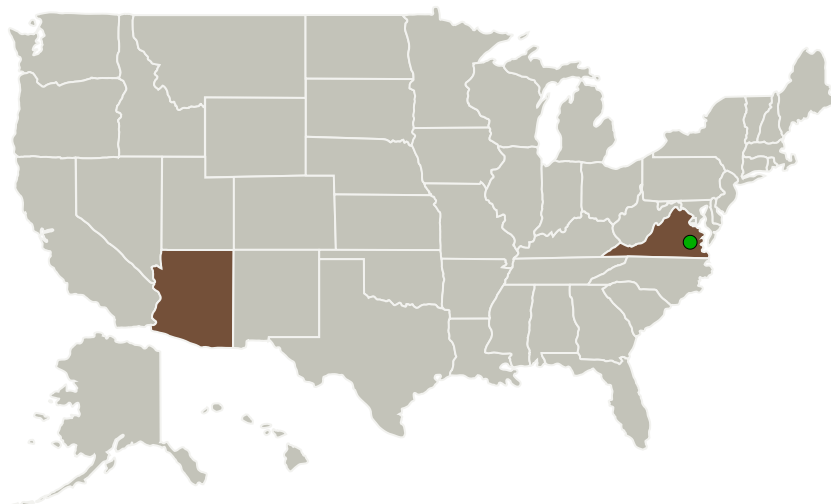
Completed Technology Project (2012 - 2012)



Project Introduction

In this effort, ZONA Technology, Inc. aims at developing an innovative multi-fidelity and multi-disciplinary optimization (MDO) sub-framework that can (i) effectively reduce the number of design variables without screening-out any of the variables, (ii) accelerate the convergence through a novel design space evolution technique, and (iii) enable rapid determination of design sensitivities (gradients) for all the levels of fidelity during aerodynamic analyses. The innovative application of Proper Orthogonal Decomposition for design variable reduction, when coupled with the fitness-driven Design Space Evolution scheme is an ideal optimization technique for the conceptual and preliminary design stages, wherein, a large number of configurations are rapidly sampled. To facilitate process automation and to achieve time-saving, the finite element mesh morphing will be incorporated through the use of ZMORPH, ZONA's Boundary Element Method based mesh-morphing code. For an effective system-level data-flow between various disciplines, the proposed optimization sub-framework will be integrated using Phoenix Integration Inc.'s ModelCenter software. In collaboration with Phoenix Integration Inc., ZONA team will develop the functional plug-ins for the ZONA codes involved in the sub-framework. Once developed, such a framework will be demonstrated for its robustness on a non-conventional Supersonic Tailless Air Vehicle (STAV) platform. The current NASA MDO framework, as well as other industry-standard MDO frameworks will benefit significantly from the inclusion of ZONA's modular MDO sub-framework for conceptual design optimization.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
ZONA Technology, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Arizona	Virginia
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Project Transitions

**February 2012:** Project Start**August 2012:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140672>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ZONA Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

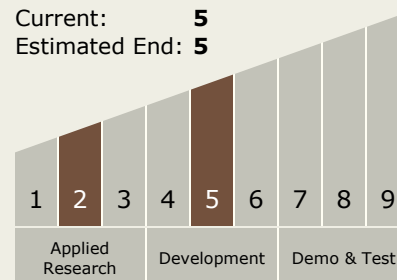
Carlos Torrez

Principal Investigator:

Darius Sarhaddi

Technology Maturity (TRL)

Start: 2
Current: 5
Estimated End: 5



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - └ TX11.5 Mission Architecture, Systems Analysis and Concept Development
 - └ TX11.5.3 Tools and Methodologies for Vehicle or Concept Definition Activities

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System